A Plan to Reduce Fecal Bacteria, Sediment and Total Dissolved Solids in the Upper Clinch River Watershed

Prepared for:

Department of Environmental Quality

Submitted April 5th, 2011

Submitted by:
MapTech, Inc.
3154 State Street
Blacksburg, VA 24060

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EXECUTIVE SUMMARY

Agricultural Best Management Practices (BMPs)

Streamside fencing is one of the best ways to reduce bacteria and sediment levels in the stream. This will remove direct livestock defecation in the stream and prevent the trampling of the stream banks.

The length of fencing required on perennial streams in the Upper Clinch River watershed is approximately 51 miles. Table E.1 shows the fencing systems needed to meet the livestock exclusion goal. Both the grazing land (LE-1T) and streambank protection (WP-2T) practices include a 35-ft buffer component (LE-2T systems require at least a 10 foot buffer). Therefore, these practices will provide some of the best water quality benefits in terms of reducing both direct (cows defacating in the stream) and land- based (runoff of fecal bacteria, sediment and total dissolved solids (TDS) into streams during rain events) contributions of fecal bacteria to the stream.

Table E.1 LE-1T, LE-2T and WP-2T fence exclusion systems required for the Upper Clinch River watershed.

Watershed	LE-1T Systems	LE-2T Systems	WP-2T Systems
Upper Clinch River Watershed – Tazewell*	12	11	?
Upper Clinch River Watershed – Richlands	100	99	?

*Fewer systems are required in the Tazewell area because a previously approved implementation plan for a benthic macro-invertebrate impairment required fence exclusion practices in most of this area.

Due to the significant reductions needed on land-based loads of *E. coli* bacteria, additional Best Management Practices (BMPs) for pasture and cropland are also needed. Estimates of all agricultural BMPs needed for Stage I, the first five years in the watershed are provided in Table E.2.

Table E.2 Agricultural land based reduction BMPs required for delisting.

Control Measure	Unit	Upper Clinch River - Tazewell	Upper Clinch River - Richlands
Improved Pasture Management	Acres	3,474	0
Reforestation of Erodable Cropland –FR1	System	631	547
Conservation Tillage	Acres	133	0
Riparian Vegetated Buffers – Cropland	Acres	110	0
Retention Ponds on Pasture	Acres	4,950	0

Residential Best Management Practices (BMPs)

All failing septic systems and straight pipes must be identified and replaced during implementation since a 100% load reduction from direct and nonpoint source (NPS) human waste is required to meet the TMDL goals. In addition, straight pipes are illegal in the Commonwealth of Virginia. The estimated numbers of straight pipes and failing septic systems were reported in the TMDL study and are shown in Table E.3.

Table E.3 Estimated residential waste treatment systems required for delisting.

Watershed	Houses with Standard Septic Systems	Potential Failing Septic Systems	Potential Straight Pipes -
Upper Clinch River Watershed – Tazewell	1,813	438	129
Upper Clinch River Watershed – Richlands	2,939	611	379

The Upper Clinch River watershed TMDL allocations call for significant reductions to land-based residential loads. In order to achieve these reductions, the BMPs in Table E.4 must be implemented. The Pet Waste Program shown in the table includes distributing information on how pet waste should be disposed. An additional Pet Waste Composter program is also proposed to eliminate pet waste in homeowner's yards. The program includes the distribution of pet waste composters to households and dog kennels in this watershed. This could be accomplished through partnerships with local stores selling pet

food, the Tazewell County Animal Shelter, the Society for the Prevention and Cruelty to Animals (SPCA) and the County government.

Table E.4 All residential BMPs recommended to meet the delisting requirements (first 5 years of implementation).

Residential Control Measure Description	VA Cost-Share Practice Number	Upper Clinch River - Tazewell	Upper Clinch River - Richlands
Septic Systems Pump-out Program	NA	1,813	2,939
Failing Septic Systems			
Septic System Repair	RB-3	88	122
Septic System Installation/Replacement	RB-4	210	293
Alternative Waste Treatment System Installation	RB-5	105	147
Connect to Sewer System	NA	35	49
Straight Pipes			
Septic System Installation	RB-4	77	227
Alternative Waste Treatment System Installation	RB-5	13	114
Connect to Sewer System	NA	39	38
Pet Waste			
Residential Pet Waste Education Program	NA	1	1
Residential Pet Waste Composter	NA	4,128	7,205

Table E.5 shows the BMPs required for meeting the sediment and TDS reduction requirements in the Coal Creek watershed.

Table E.5 All industrial BMPs recommended to meet the delisting requirements (first 5 years of implementation).

Industrial Control Measure	Unit	Quantity
Reclamation of Abandoned Mine Land	Acres	46.5
Dirt Road Stabilization	Acres	1.44
Forest Harvesting BMPs	Acres	695.2

Tables E.6 and E.7 show the estimated cost of installing the recommended agricultural and residential BMPs in Stages I (implementation years 1 - 5) and II (implementation years 6 – 10). The total cost for Stage I is $26.41 million. The total cost for full implementation comes to $32.10 million (Table E.8). All BMPs are expected to be completed by the end of Stage II. Stage III (implementation years 11 – 15) is considered a time of stabilization for the watershed after all BMPs have been utilized. A Timeline with pollutant reductions expected is shown in Figures E.1 and E.2.

Table E.6 Costs to implement Stage I (years 1 - 5) for the Upper Clinch River watershed.

Impairment	Agricultural BMPs ($)	Residential BMPs ($)	Industrial BMPs ($)	Technical Assistance ($)	Total ($)
Upper Clinch River Watershed – Tazewell	1,457,000	5,037,000	NA	NA	6,494,000
Upper Clinch River Watershed – Richlands	6,637,000	9,562,000	3,715,000	NA	19,920,000
Total	**8,094,000**	**14,600,000**	**3,715,000**	**0**	**26,410,000**

Numbers are rounded to four significant digits.

Table E.7 Costs to implement Stage II (years 6 - 10) for the Clinch River and Tributaries watershed.

Impairment	Agricultural BMPs ($)	Residential BMPs ($)	Industrial BMPs ($)	Technical Assistance ($)	Total ($)
Upper Clinch River Watershed – Tazewell	690,200	323,200	NA	90,000	1,103,000
Upper Clinch River Watershed – Richlands	240,100	541,200	3,715,000	90,000	4,587,000
Total	**930,300**	**864,400**	**3,715,000**	**180,000**	**5,691,000**

Numbers are rounded to four significant digits.

Table E.8 Total cost for implementation in the Clinch River and Tributaries watershed.

Impairment	Agricultural BMPs ($)	Residential BMPs ($)	Industrial BMPs ($)	Technical Assistance ($)	Total ($)
Upper Clinch River Watershed – Tazewell	2,147,000	5,360,000	NA	90,000	7,597,000
Upper Clinch River Watershed – Richlands	6,877,000	10,100,000	7,430,000	90,000	24,500,000
Total	**9,024,000**	**15,460,000**	**7,430,000**	**180,000**	**32,090,000**

Numbers are rounded to four significant digits.

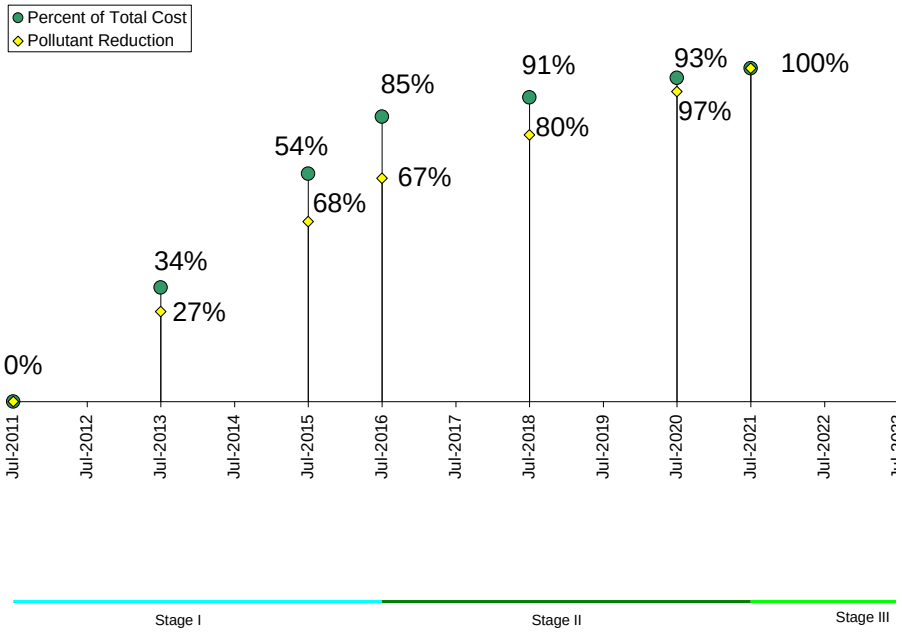

Figure E.1 Timeline for implementation in the Upper Clinch River watershed - Tazewell.

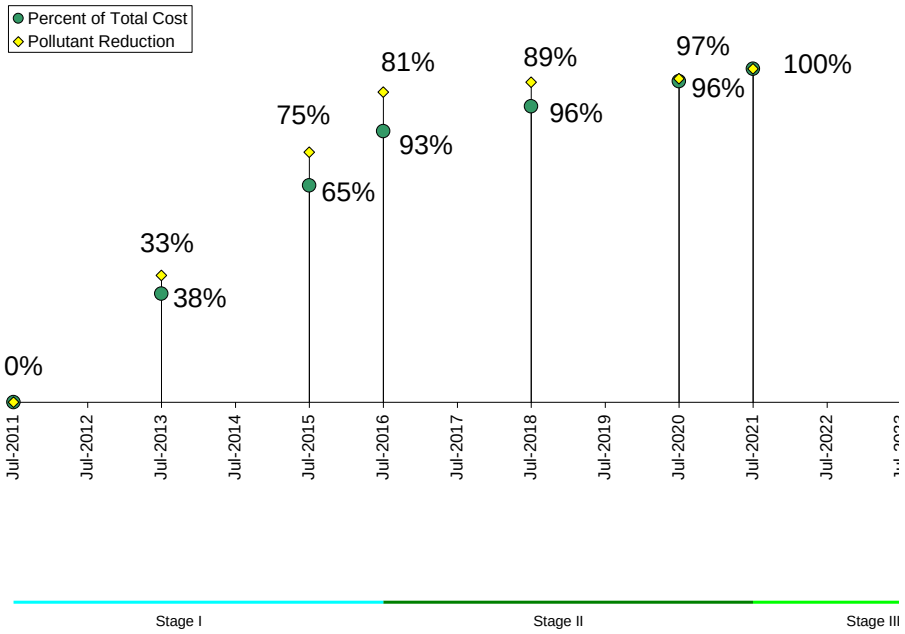

Figure E.2 Timeline for implementation in the Upper Clinch River watershed - Richlands.

INTRODUCTION

1. Conduct a TMDL study to determine which pollutants and sources are causing the stream to fail to meet its water quality standards.
2. Develop an implementation plan containing the actions needed to reduce those pollutants.
3. Implement the actions of the plan and track the improvements in water quality.

The Federal Clean Water Act (CWA) became law in 1972 and requires that all U.S. streams, rivers, and lakes meet certain water quality standards. The CWA also requires that states conduct monitoring to identify polluted waters or those that do not meet standards. Through this required program, the state of Virginia has found that many stream segments do not meet state water quality standards for protection of the six beneficial uses: fishing, swimming, shellfish, aquatic life, wildlife and drinking.

When a stream fails to meet the water quality standards, it is listed as impaired, or dirty, on the CWA's Section 303(d) list. When this occurs, the CWA and the U.S. Environmental Protection Agency (EPA) both require that states develop a Total Maximum Daily Load (TMDL) for each pollutant. A TMDL is a "pollution budget" for a stream. That is, it sets limits on the amount of pollution that a stream can tolerate and still maintain water quality standards. A TMDL accounts for seasonal variations and must include a margin of safety (MOS).

TMDL PROCESS

After a stream is listed on the impaired waters list, or "303(d) list," the TMDL process includes three steps:

Step one of the TMDL process was completed for the Banister River and Tributaries Watershed with the completion of its TMDL study and the approval of the TDML by the EPA in 2007. The results of the TMDL are summarized in the *Review of the TMDL Development Study* section of this booklet. Now that TMDL studies have been developed and approved by the EPA and the State Water Control Board (SWCB), measures must be taken to reduce pollution levels in the stream as specified in the TMDL.

Step two of the TMDL process is the development of the Implementation Plan - Technical Report. This booklet is an abbreviated version of the Technical Report which can be obtained by contacting the Virginia Department of Conservation and Recreation. In fulfilling the state's requirement for the development of an implementation plan, a framework has been established for reducing *E. coli* levels and achieving the water

quality goals for the impaired stream segments of the Banister River and Tributaries. This plan outlines how the TMDL goals can be accomplished in the watershed to improve water quality. The IP describes corrective actions and the installation of BMPs to be implemented in a staged manner. Step two of the TMDL process will be officially concluded with the approval of the Implementation Plan - Technical Report by the EPA.

Step three in the TMDL process is to meet these water quality goals through implementation of the plan. Having finalized the Implementation Plan increases the opportunities for implementation funding, and provides guidance to the residents of this watershed on how to improve water quality in their community and enhance their natural resources. The implementation of this plan will reduce levels of bacteria in Banister River and Tributaries watershed. The benefits of the implementation of this plan are described in detail in the *Implementation Benefits* chapter of this document. In short, the implementation of this plan may provide benefits to homeowners and farmers, as well as those that use the streams for recreation purposes.

REQUIREMENTS FOR IMPLEMENTATION PLANS

State Requirements

The TMDL IP is a requirement of Virginia's 1997 Water Quality Monitoring, Information, and Restoration Act (§62.1-44.19:4 through 19:8 of the Code of Virginia), or WQMIRA. WQMIRA directs the state's State Water Control Board to "develop and implement a plan to achieve fully supporting status for impaired waters." In order for IPs to be approved by the Commonwealth, they must meet the requirements as outlined by WQMIRA. WQMIRA requires that IPs include the following:

- Date of expected achievement of water quality objectives,
- Measurable goals,
- Necessary corrective actions, and
- Associated costs, benefits, and environmental impact of addressing the impairment.

Federal Requirements

Section 303(d) of the CWA and current EPA regulations do not require the development of implementation strategies. The EPA outlines the minimum elements of an approvable IP in its 1999

Guidance for Water Quality-Based Decisions: The TMDL Process. The listed elements include:

- A description of the implementation actions and management measures,
- A time line for implementing these measures,
- Legal or regulatory controls,
- The time required to attain water quality standards, and
- A monitoring plan and milestones for attaining water quality standards.

REVIEW OF THE TMDL

Watershed Characteristics

The Upper Clinch River watershed is part of the Clinch River Basin and is located within USGS hydrologic unit code 06010205 (Clinch River). The Upper Clinch River watershed is approximately 115,000 acres. See Figure 1 for a map of the Upper Clinch River impaired segments. Table 1 describes each impairment in the Upper Clinch River watershed addressed in this implementation plan.

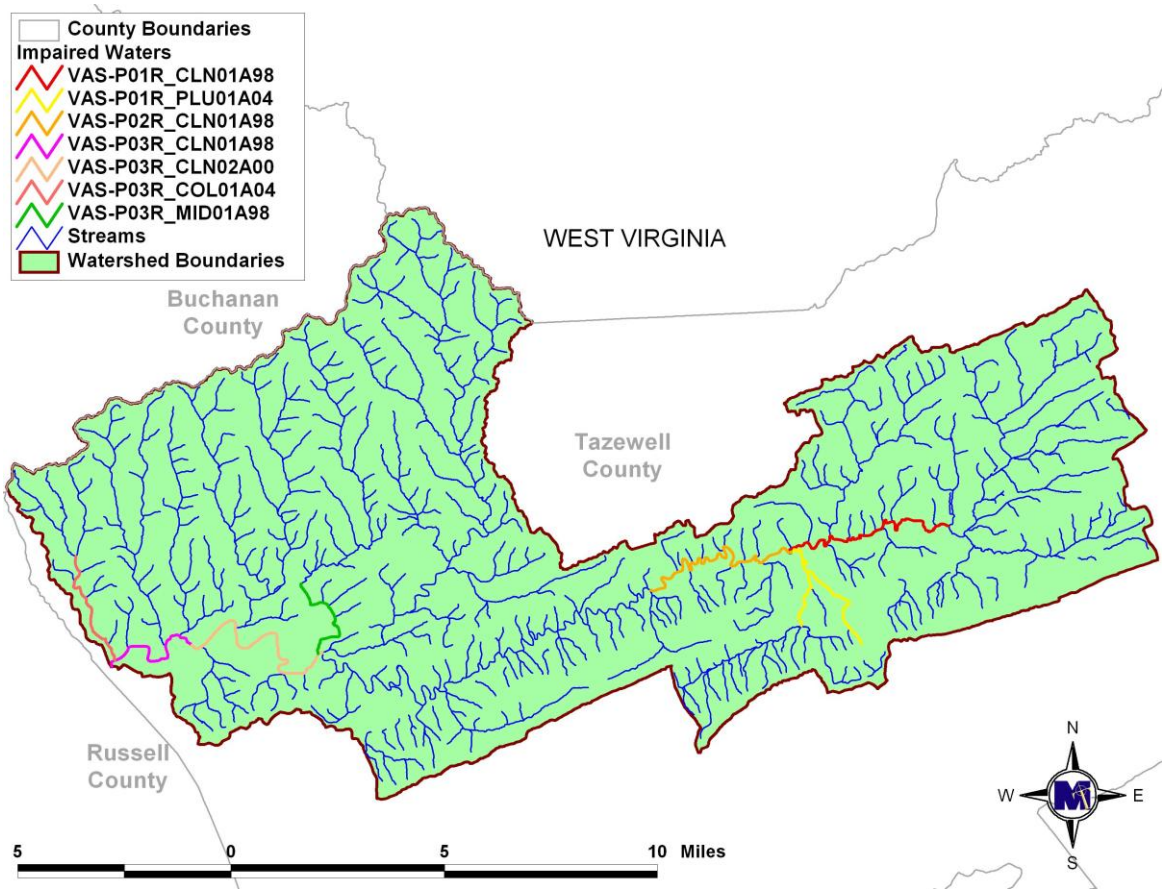

Figure 1 The Upper Clinch River watershed impaired segments.

Table 1 Impairments within the Upper Clinch River watershed included in this study

Stream Name Impairment ID	Impairment(s) Contracted	Initial Listing Year	2008 River Miles	2008 Listing Violation%	Impairment Location Description
Middle Creek VAS-P03R_MID01A98	*E. coli*	2006	2.65	30 EC	River mile 2.53 downstream to Clinch River.
Coal Creek VAS-P03R_COL01A04	Benthic & *E. coli*	2008/2010	3.07	NA	Left Fork Coal Creek downstream to Clinch River.
Clinch River VAS-P03R_CLN02A00	*E. coli*	2004	5.39	24 EC	Dry Branch confluence downstream to the Raven-Doran raw intake just upstream from Town Hill Creek.
Clinch River VAS_P03R_CLN01A98	*E. coli*	2002	3.10	18 EC	Raven-Doran raw water intake downstream to the Mill Creek confluence.
Clinch River VAS-P01R_CLN01A98	Fecal coliform	2004	5.5	33 FC	Lincolnshire Branch confluence downstream to Plum Creek confluence.
Clinch River VAS-P02R_CLN01A98	Fecal coliform	2006	6.01	27 FC	Plum Creek confluence downstream to the Deskins Creek confluence.
Plum Creek VAS-P01R_PLU01A04	Fecal coliform	2004	5.06	33 FC	From the headwaters downstream to the Clinch River confluence.

Pollutant Reduction Goals

These TMDL studies were conducted because specific stream segments in the Upper Clinch River watershed were not meeting the state water quality standards for the recreation use (swimming) and aquatic life use. In order to meet the water quality goals established by the TMDL studies, any bacteria water sample from the stream must be equal to or less than 235 colony forming units per 100 milliliters (cfu/100mL) for *E. coli* at all times. If multiple samples are collected within a 30-day period, a geometric mean is applied and it must be equal to or less than 126 cfu/100mL.

Information from the TMDL studies determined the water quality goals and associated pollutant reductions needed in the implementation plan. The TMDL goals for the implementation plan are to address those sources of bacteria that can be attributed to human activities. The correction of straight pipes and failing septic systems are necessary to meet the TMDL goals. In addition, the majority of livestock in the watershed will need to be excluded from the creeks. Runoff carrying *E. coli* into the creeks after rain events must also be addressed. Reductions to wildlife fecal bacteria are not addressed in this implementation plan. A summary of the final *E. coli* allocations for the different sources in this watershed that resulted from the TMDL study is given in Table 2.

A summary of the final total dissolved solids and sediment allocations for different sources in the watershed resulting from the TMDL study are given in Tables 3 and 4.

Table 2 Fecal Bacteria Load reductions allocated for the Upper Clinch River watershed TMDLs.

Impairment	Failed Septic Systems and Straight Pipes	Direct Livestock	Residential Nonpoint Sources	Agricultural Nonpoint Sources
Upper Clinch River Watershed – Tazewell	100%	100%	99%	99%
Upper Clinch River Watershed – Richlands	100%	100%	86%	59%
Indian Creek	100%	100%	75%	85%

Table 3 Total Dissolved Solids (TDS) load reductions allocated for Coal Creek TMDL.

Parameter	Failed Septic and Straight Pipes	Direct Livestock	Abandoned Mine Land	Agricultural Nonpoint Sources
TDS	100%	80%	80%	80%

Table 4 Sediment Load reductions allocated for the Coal Creek TMDL.

Sediment Source	Reductions (%)
Abandoned Mine Land	97
Residential	50
Commercial	50
Barren*	68
Disturbed Forest	97
Pasture	58
Streambank Erosion	36
Straight Pipes	100

*Barren - Areas of bedrock, strip mines, gravel pits, and other accumulations of earthen material. Generally, vegetation accounts for less than 15% of total cover.

Public Participation

The actions and commitments described in this document are drawn together through input from citizens of the watershed, county government, DEQ, DCR, Virginia Department of Health (VDH), Virginia Cooperative Extension (VCE), Virginia Department of Forestry (DOF), Tazewell Soil and Water Conservation District (TSWCD), and MapTech, Inc. Every citizen in the watershed and interested party is encouraged to become involved in the implementation process and contribute to restoring the health of the streams. Public participation in development of the plan took place on three levels: public meetings, working groups, and a steering committee.

A public meeting was held on 12/21/2010 to inform the public about the water quality impairments in the Upper Clinch River watershed and outline the goals for improving water quality through an implementation plan. A second public meeting took place on 4/3/2011 to request feedback from citizens on the draft implementation plan.

Specialized working groups were assembled to discuss specific implementation strategies for different sources of bacteria in this watershed and recommend actions for the plan. The working groups were divided into three focus areas: residential, agricultural and governmental/industrial.

A steering committee was formed with representation from DEQ, DCR, VDH, TSWCD, and representatives from the working groups. This committee reviewed recommendations from the working groups and the draft implementation plan before it was made public.

IMPLEMENTATION ACTIONS

The following BMPs are recommended to meet the fecal bacteria, sediment and total dissolved solids reductions required in the TMDLs to meet water quality goals.

Agricultural BMPs

Streamside fencing is one of the best ways to reduce fecal bacteria and sediment levels in streams in agricultural watersheds. This will remove direct livestock defecation in the stream and prevent the trampling of the stream banks. The quantity of streamside fencing needed was determined through spatial analyses of land uses, the stream network, and archived data. Additionally, input from local agency representatives and citizens were used to verify the analyses.

Livestock stream exclusion example.

Several different fencing options are available through state, federal, and private cost share programs. *Livestock Exclusion with Riparian Buffers for TMDL Implementation* (**LE-1T**) systems include streamside fencing, cross fencing, an alternative watering system, and a 35-ft buffer from the stream. It offers an 85% cost share and is only available in targeted TMDL watersheds with implementation plans.

Livestock Exclusion with Reduced Setback Practice for TMDL Implementation (**LE-2T**) systems are only available in targeted TMDL areas with implementation plans. This practice requires a 10 foot setback for stream fencing, and is more flexible in fencing materials allowed. Cost share is provided for stream fencing and cross fencing, and off stream waterers at a rate of 50%.

The *Streambank Protection for TMDL Implementation* (**WP-2T**) systems include streamside fencing, hardened crossings, and a 35-ft buffer from the stream. The WP-2T practice is only available in TMDL targeted implementation areas. This practice includes 75% cost-share and an up-front cost share payment of 50 cents per linear foot of fence installed to assist in covering anticipated fencing maintenance costs.

Off stream watering source for cattle.

Financial assistance for streamside fencing is also available through cost-share programs such as the Conservation Reserve and Enhancement Program (CREP). In general, cost-shares of 50% - 100% are available to help pay for fencing which excludes livestock from farmland adjacent to streams, creating a riparian buffer. It is recommended that participants consult the experienced personnel at their local SWCD in order to choose the most applicable exclusion system and the funding sources to match. Several fencing practices are summarized in Table 2.

Table 2. Fencing cost-share practices comparison

DCR Spec. #	Required Buffer Distance	Maximum Cost Share	Components Available for Cost-share				
			Permanent Stream Fencing	Cross Fencing	Alternate Water Supply	Restricted Crossing	Hardened Access or Crossing
LE - 1T	35	85%	X	X	X	X	
LE - 2T	10	50%	X	X	X	X	
WP- 2T	35	75%	X				X

The quantity of streamside fencing needed was determined through spatial analyses of land uses, the stream network, and archived data. Additionally, input from local agency representatives and citizens were used to verify the analyses.

Photo of badly eroded streams banks from direct livestock accessin Pulliam Branch (Campbell County) 11/2/2000.

The length of fencing required on perennial, flowing year round, streams in the Upper Clinch River watershed is approximately 51 miles. In order to assess this goal, the state cost-share program for agricultural best management practices (BMPs) was utilized. The total fencing needed was divided up among the different BMPs offered through the state cost-share program that include a fencing component. Table 5 shows the fencing systems required for the impaired watershed in order to meet the livestock exclusion goal.

Table 5 LE-1T and LE-2T (Grazing Land Protection) and WP-2T (Streambank Protection) fence exclusion systems required for Upper Clinch River watershed.

Watershed	LE-1T systems	LE-2T systems	WP-2T systems
Upper Clinch River Watershed – Tazewell*	12	11	?
Upper Clinch River Watershed – Richlands	100	99	?

The average system project length was 1,200 feet.

*Fewer systems are required in the Tazewell area because a previously approved implementation plan for a benthic macro-invertebrate impairment required fence exclusion practices in most of this area.

Agricultural land-based reduction BMPs

Due to the reductions needed on land-based loads of *E. coli* bacteria, additional BMPs for pasture and cropland are also needed. Estimates of all agricultural BMPs needed for Stage I, the first five years (delisting from the 303(d) list), are listed in Table 6.

Stormwater runoff from farmland picks up fecal bacteria from manure and causes soil-loss and erosion of valuable land along its path to the stream. There are several BMPs that can be applied to farmland that will help prevent soil and bacteria from ending up in streams.

Along with the infrastructure provided by a streamside fencing system, improved *Pasture Management* includes: maintaining forage height during growing season, application of lime and fertilizer when needed, controlling woody vegetation, distribution of manure through managed rotational grazing, and reseeding if necessary. Employing the pasture management practices listed above can produce significant economic gains to producers at a very low investment cost.

Prescribed grazing and *Pasture and Hayland Planting* are two BMPs, which go hand and hand with pasture management. Prescribed grazing is managing the harvest of vegetation with grazing and/or browsing animals. Among the benefits of prescribed grazing are maintaining a desired vegetation species composition, improved quantity and quality of forage for grazing, and reduced soil erosion. Pasture and Hayland Planting involves establishing stands of cool season perennial grasses to be used for forage, hay, pasture, or wildlife habitat. Pasture and Hayland Planting improves livestock nutrition, extends the grazing season, reduces soil erosion, and improves water quality.

Conservation tillage involves managing the intensity (frequency and aggressiveness) of soil-disturbing activities related to residue management, seedbed preparation, nutrient application, planting, and pest control while planting and growing crops. Employing conservation tillage helps prevent erosion, which also helps keep bacteria found in manure fertilizers from running off the land. Benefits include improved soil quality and reductions in time, fuel, and production costs.

Retention Ponds on pasture-land allow time for the sediment and bacteria to settle out from the captured runoff, before it flows into streams. Retention ponds have several potential benefits, including: recreational uses such as fishing, water sources, and aesthetics.

Many agricultural BMPs qualify for financial assistance. It is recommended that participants discuss funding options with experienced personnel at their local SWCD in order to choose the best option.

Environmental Quality Incentives Program (EQIP) is conservation program for farmers and landowners to address significant natural resource needs and objectives offers 5 to 10-year contracts to landowners and farmers to provide 75% cost-share assistance, 25% tax credit, and/or incentive payments to implement conservation. Eligible land includes cropland, pasture, and other agricultural land in priority areas, or land that has an environmental need that matches one of the statewide concerns.

Table 6 Agricultural land based reduction BMPs required for delisting.

Control Measure	Unit	Upper Clinch River Watershed – Tazewell	Upper Clinch River Watershed – Richlands
Improved Pasture Management	Acres	4,105	
Conservation Tillage	Acres	133	
Reforestation of Erodable Pasture	Acres	631	547
Riparian Vegetated Buffers – Cropland	Acres	110	

Residential BMPs

All straight pipes and failing septic systems must be identified and corrected during implementation since a 100% load reduction from these sources was deemed necessary to meet the TMDL goal. Table 7 shows the number of failing septic systems and straight pipes that need correcting in the study area.

The Upper Clinch River watershed TMDL allocations call for large fecal bacteria reductions in runoff from residential areas. In order to achieve these reductions, the BMPs in Table 8 are targeted. The BMPs include removing straight pipes and replacing failing septic systems, proper disposal of pet waste by homeowners, kennel owners, hunt clubs, etc.

Table 7 Estimated residential waste treatment systems required for delisting.

Watershed	Houses with Standard Septic Systems	Potential Failing Septic Systems	Straight Pipes
Upper Clinch River Watershed – Tazewell	1,813	438	129
Upper Clinch River Watershed – Richlands	2,939	611	379
Total	**4752**	**1,049**	**508**

Septic Systems

All failing septic systems and straight pipes must be identified and replaced during implementation since a 100 percent load reduction from direct and nonpoint source (NPS) human waste is required to meet the TMDL goals. In addition, straight pipes are illegal in the Commonwealth of Virginia. The estimated numbers of straight pipes and failing septic systems were reported in the TMDL studies.

Financial assistance could be provided through grants to provide cost-share for homeowners to pump out their septic tanks. While it is not likely that sufficient grant funds will be available to assist every homeowner in this watershed with a septic system pump-out, it is expected that this type of outreach will raise local awareness and lead homeowners to assume responsibility for maintaining their systems. In turn, this will help to prevent septic system failures in the future.

Pet Waste

The Pet Waste Program shown in Table 8 includes bacteria-reducing practices including distribution of information on proper disposal of pet waste, to pet owners, kennel operators and hunt clubs; signage regarding proper disposal of pet waste in public areas, along with pet waste disposal stations in public dog walking areas. A Pet Waste Composter program is also proposed to help eliminate pet waste in homeowners' yards and at kennels in addition to public places. The program includes the distribution of pet waste composters to households in this watershed with pets. This could be accomplished through partnerships with local stores selling pet food, the Tazewell County Animal Shelter and the Society for the Prevention of Cruelty to Animals (SPCA).

Technical Assistance

Technical assistance needed for implementing the identified BMPs was measured in full-time equivalents (FTEs), with one FTE being equal to one full-time position. One FTE is needed for the final three years of the implementation period. Implementation is already proceeding in the headwaters of the watershed. The TSWCD will continue to be responsible for implementation in the watershed.

IMPLEMENTATION COSTS

Agricultural BMP Costs

The cost for implementation of individual agricultural BMPs were estimated based on data for these watersheds from the Virginia DCR Agricultural BMP Database. Associated cost estimates of agricultural and residential BMPs were calculated by multiplying the unit cost of each practice by the number of units in each watershed. Cost estimates were adjusted based on stakeholder comments and input.

Table 8. Estimated agricultural BMP costs by area.

Practice	Cost Share Code	Units	Unit Cost	Cost by Area	
				Upper Clinch River - Tazewell Area	Upper Clinch River - Richlands Area
Livestock exclusion with riparian buffers					
Farms >100 acres	LE-1T	system	$53,000	$318,000	$2,650,000
Farms <100 acres	LE-1T	system	$11,000	$69,000	$575,000
	WP-2T	system	$5,000		
Livestock exclusion with reduced setbacks					
Farms >100 acres	LE-2T	system	$53,000	$265,000	$2,597,000
Farms <100 acres	LE-2T	system	$11,000	$69,000	$575,000
Livestock Exclusion fence maintenance (15 yrs)	N/A	feet	$3.50	$7,340	$64,453
Land Based Practices					
Reforestation of Erodable Pasture	FR-1	acres	$154	$97,174	$84,238
Improved Pasture Management	N/A	acres	$107	$371,718	
Conservation Tillage		acres	$100	$13,300	
Vegetated Buffers - Cropland	CP-33, WQ-1	acres	$110	$39,600	
Retention Ponds - Pasture	N/A	acres	$138	$686,550	
TOTAL ESTIMATED COST				**$1,936,682**	**$6,545,691**

Residential BMP Costs

Cost of residential BMP practices were based on input from VDH representatives and adjusted based on stakeholder input to reflect costs relative to this area.

Table 9 Estimated residential BMP costs by area.

Practice	Cost share code	Units	Unit Cost	Cost by Area	
				Upper Clinch River - Tazewell Area	Upper Clinch River - Richlands Area
Septic tank pumpout	N/A	pumpout	$220	$199,540	$323,400
Connection to public sewer	RB-2	connection	$5,000	$368,700	$434,000
Septic system repair	RB-3	repair	$3,500	$306,600	$427,700
Septic system replacement	RB-4	system	$6,500	$1,869,660	$3,385,200
Alternative waste management system	RB-5	system	$20,000	$2,360,400	$5,208,000
Pet waste education program	N/A	program	$3,750	$3,750	$3,750
Pet waste composter	N/A	composter	$60	$247,680	$432,300
TOTAL ESTIMATED COST				**$5,356,330**	**$10,214,350**

Table 10 Estimated industrial BMP costs for Coal Creek.

Practice	Cost share code	Units	Unit Cost	Coal Creek
Reclamation of Abandoned Mine Land (ac)	N/A	acres	$10,000	$465,000
Dirt Road Stabilization (ac)	N/A	acres	$10,000	$14,400
Forest Harvesting BMPs	N/A	acres	$10,000	$6,950,000
TOTAL ESTIMATED COST				**$7,429,400**

Technical Assistance Costs

It was determined by the TSWCD that it would require $60,000 to support the salary, benefits, travel, training, and incidentals for education for one technical FTE. Technical assistance is already proceeding in the headwaters of the watershed and those costs were established in the previously approved implementation plan for the benthic impairment on the Upper Clinch River. Therefore it was determined that technical assistance would need to be provided for three more years

Tables 11 and 12 show the estimated cost of installing the recommended agricultural, industrial and residential BMPs in Stages I and II Factoring in technical assistance costs, the total cost for full implementation in the Upper Clinch River watershed comes to $32.1 million (Table 13).

Table 11 Costs to implement Stage I (years 1 - 5) for the Upper Clinch River watershed.

Impairment	Agricultural BMPs ($)	Residential BMPs ($)	Industrial BMPs ($)	Technical Assistance ($)	Total ($)
Upper Clinch River Watershed – Tazewell	1,457,000	5,037,000	NA	NA	6,494,000
Upper Clinch River Watershed – Richlands	6,637,000	9,562,000	3,715,000	NA	19,920,000
Total	**8,094,000**	**14,600,000**	**3,715,000**	**0**	**26,410,000**

Numbers are rounded to four significant digits.

Table 12 Costs to implement Stage II (years 6 - 10) for the Clinch River and Tributaries.

Impairment	Agricultural BMPs ($)	Residential BMPs ($)	Industrial BMPs ($)	Technical Assistance ($)	Total ($)
Upper Clinch River Watershed – Tazewell	690,200	323,200	NA	90,000	1,103,000
Upper Clinch River Watershed – Richlands	240,100	541,200	3,715,000	90,000	4,587,000
Total	**930,300**	**864,400**	**3,715,000**	**180,000**	**5,691,000**

Numbers are rounded to four significant digits.

Table 13 Total cost for implementation in the Clinch River and Tributaries watershed.

Impairment	Agricultural BMPs ($)	Residential BMPs ($)	Industrial BMPs ($)	Technical Assistance ($)	Total ($)
Upper Clinch River Watershed – Tazewell	2,147,000	5,360,000	NA	90,000	7,597,000
Upper Clinch River Watershed – Richlands	6,877,000	10,100,000	7,430,000	90,000	24,500,000
Total	9,024,000	15,460,000	7,430,000	180,000	32,090,000

Numbers are rounded to four significant digits.

TIMELINE AND MILESTONES

The intended implementation goal is to restore the Upper Clinch River watersheds' water quality to attain the fecal bacteria and aquatic life standards and the removal of these streams from Virginia's Section 303(d) impaired waters list. Progress toward end goals will be assessed during implementation through tracking of BMP installations and continued water quality monitoring.

Expected progress in implementation is established with two types of milestones: implementation milestones and water quality milestones. Implementation milestones establish the amount of BMPs installed each year, while water quality milestones establish the corresponding improvements in water quality that can be expected. The milestones described here are intended to achieve full implementation of the TMDL within 15 years. Stage I and Stage II timelines extend out to 2026 with expected pollutant reductions shown in the timeline of implementation milestones, Figures 2 through 3.

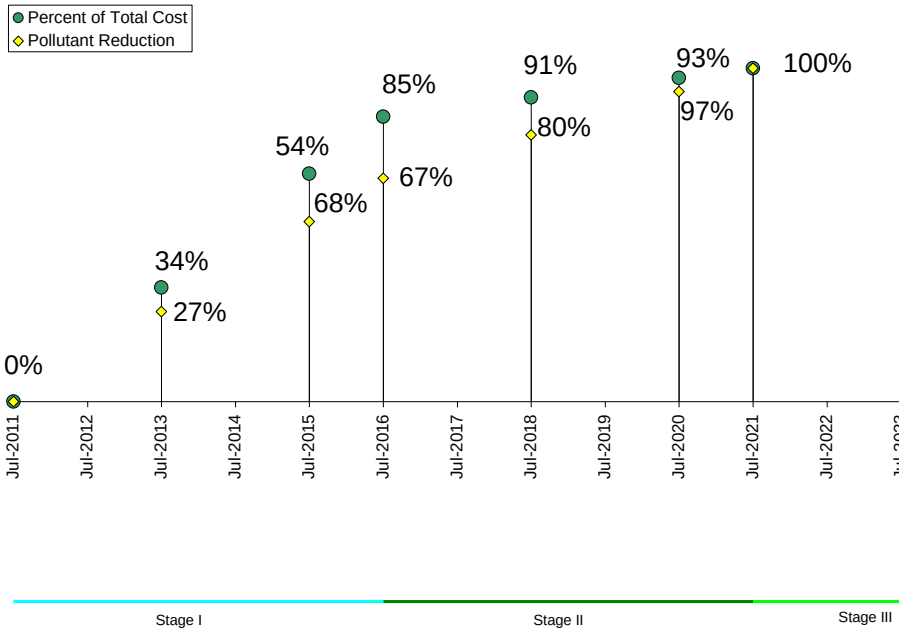

Figure 2 Timeline for implementation in the Upper Clinch River watershed - Tazewell.

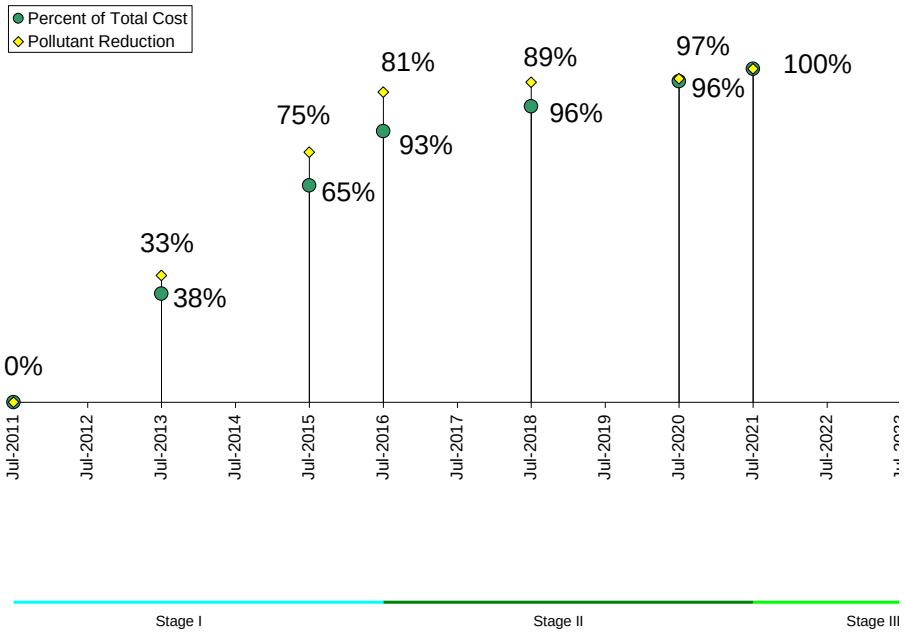

Figure 3 Timeline for implementation in the Upper Clinch River watershed - Richlands.

Following the idea of a staged implementation approach, resources and finances will be concentrated on the most cost-efficient control measures first. These measures will be the focus of Stage I. Following Stage I implementation and if a de-listing is not yet attained, the steering committee should evaluate water quality improvements and determine how to proceed to implement additional BMPs during Stage II. Stage II focuses on BMPs that are necessary for the stream to fully comply with the TMDL allocation requirements. The Department of Environmental Quality's *E. coli* bacterial standard states that there can be no exceedances of either the geometric mean (126 cfu/100 ml) or the instantaneous (235 cfu/100 ml) values. Complying with the two-part standard requires BMPs that are more difficult and costly to implement. Tables 14 and 15 show the types and quantities of BMPs to be installed during each stage.

Table 14 Stage I and Stage II BMP implementation goals for the Upper Clinch River watershed - Tazewell.

Control Measure	Unit	Stage I	Stage II
Agricultural			
Grazing Land Protection System (LE-1T)	System	12	
Grazing Land Protection System (LE-2T)		11	
Streambank Protection System (WP-2T)	System	?	
Improved Pasture Management	Acres	3,474	
Streamside Fence Maintenance	Feet	1,049	1,048
Conservation Tillage	Acres	133	
Reforestation of Erodable Pasture	Acres	631	
Vegetated Buffers – Cropland	Acres	110	
Retention Ponds – Pasture	Acres		4,975
Residential			
Septic Systems Pump-out Program*	System	907	906
Septic System Repair (RB-3)	System	88	
Septic System Installation/Replacement (RB-4)	System	288	
Alternative Waste Treatment System Installation (RB-5)	System	144	
Sewer System Connect	System	48	
Residential Pet Waste Program	Program	1	ongoing
Residential Pet Waste Compost Program	Composter	2,064	2,064

* Financial assistance for septic tank pumpouts in the watershed will be provided to homeowners in the form of cost-share; however, it is expected that some additional funding will be necessary should all homeowners in the watershed decide to participate in the program as shown in the table above.

Table 15 Stage I and Stage II BMP implementation goals for the Upper Clinch River watershed - Richlands.

Control Measure	Unit	Stage I	Stage II
Agricultural			
Grazing Land Protection System (LE-1T)	System	100	
Grazing Land Protection System (LE-2T)	System	99	
Streambank Protection System (WP-2T)	System	?	
Improved Pasture Management	Acres		
Streamside Fence Maintenance	Feet	9,208	9,207
Reforestation of Erodable Pasture	System	547	
Residential			
Septic Systems Pump-out Program*	System	1,470	1,469
Septic System Repair (RB-3)	System	122	
Septic System Installation/Replacement (RB-4)	System	521	
Alternative Waste Treatment System Installation (RB-5)	System	260	
Sewer System Connect	System	87	
Residential Pet Waste Program	Program	1	ongoing
Residential Pet Waste Composter Program	Composter	3,603	3,602
Industrial			
Reclamation of Abandoned Mine Land	Acres	23.25	23.25
Dirt Road Stabilization	Acres	0.72	0.72
Forest Harvesting BMPs	Acres	347.5	347.5

* Financial assistance for septic tank pumpouts in the watershed will be provided to homeowners in the form of cost-share; however, it is expected that some additional funding will be necessary should all homeowners in the watershed decide to participate in the program as shown in the table above.

Targeting

The impaired watershed was divided into subwatersheds for TMDL modeling purposes and this also helps with the targeting of BMP practices (Figures 4 and 5). Targeting of critical areas for livestock fencing was accomplished through analysis of livestock population and the fencing requirements for each subwatershed. The subwatersheds were ranked in descending order based on the ratio of animals per fence length along perennial streams. Failing septic systems were ranked based on the sum of the bacteria loads in each subwatershed. If feasible, effort should be made to prioritize financial and technical resources in the order of subwatersheds (Table 16).

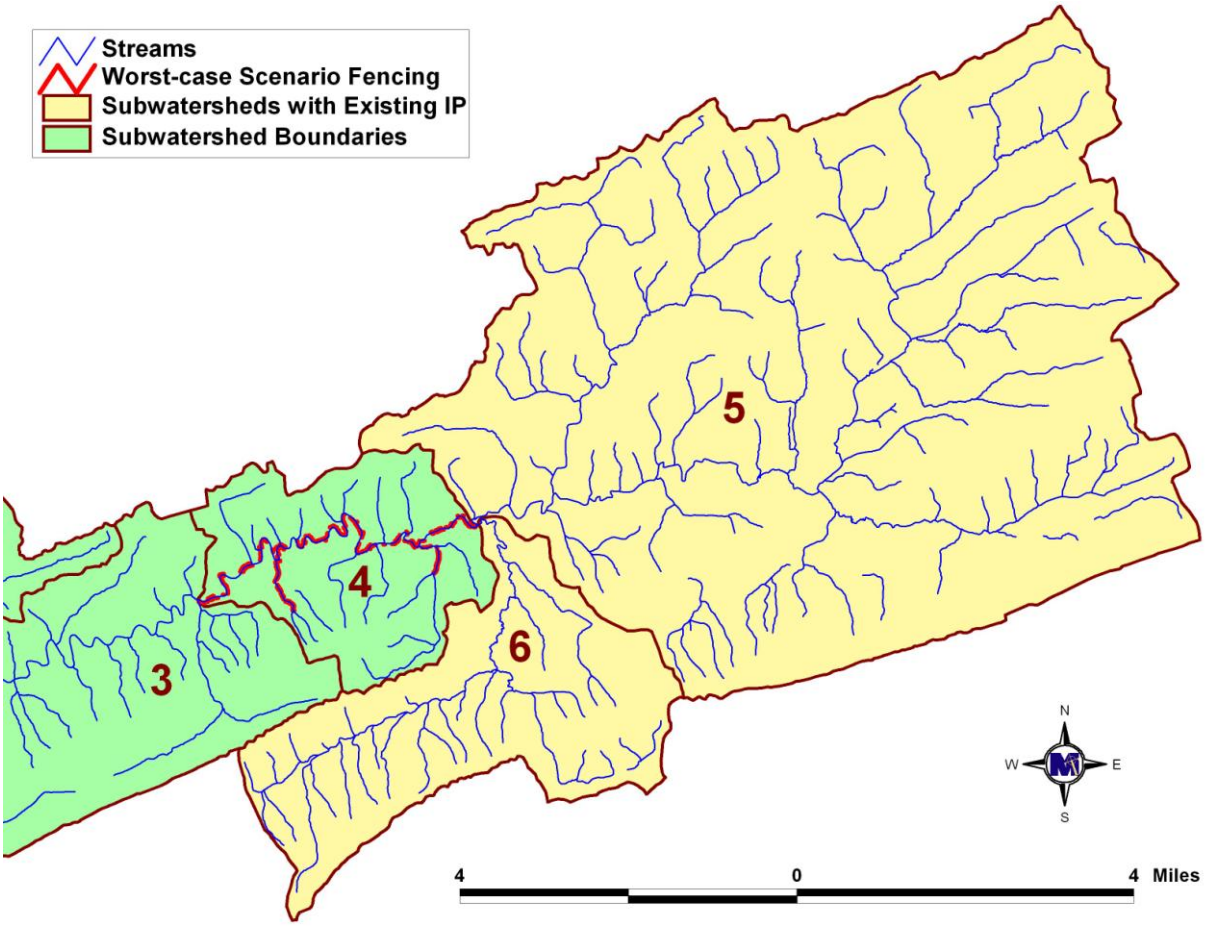

Figure 4 **Area available for streamside fencing the Upper Clinch River watershed - Tazewell.**

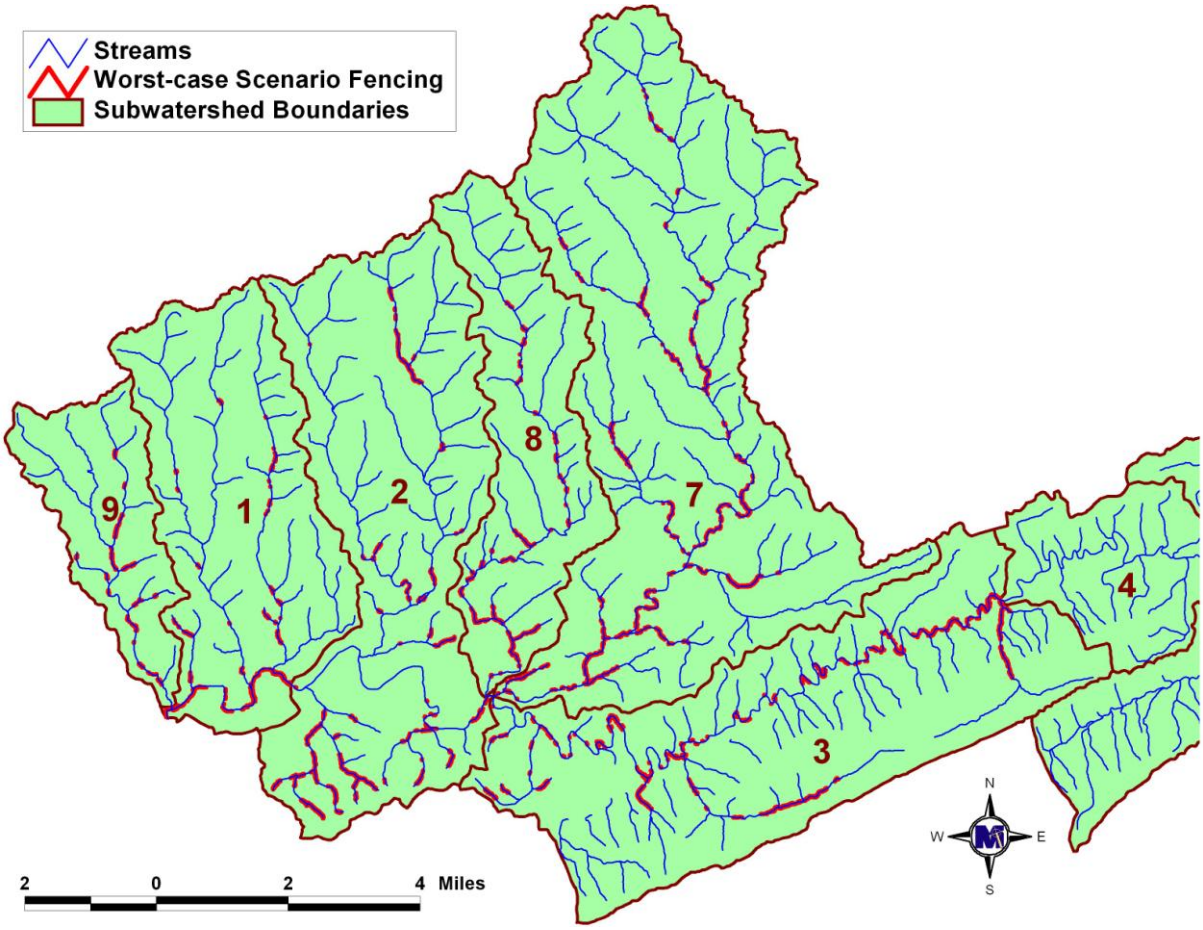

Figure 5 **Area available for streamside fencing the Upper Clinch River watershed - Richlands.**

Table 16 Targeting subwatershed order for residential waste BMPs and streamside fencing.

Stream	Failing Septic Systems	Streamside Fencing
Upper Clinch River Watershed – Tazewell*	4, 5, 6	4*
Upper Clinch River Watershed – Richlands	9, 3, 7, 8, 2, 1	3, 9, 7, 1, 2, 8

*Subwatersheds 5 and 6 are targeted for streamside fencing under a previously approved implementation plan for a Clinch River benthic impairment.

Monitoring

Improvements in water quality will be determined in the Clinch River and Tributaries watershed through monitoring conducted by the DEQ's ambient monitoring program. The monitoring data include bacteria, physical parameters (dissolved oxygen, temperature, pH, and conductivity), nutrients and suspended and dissolved solids. The VADEQ uses the data to determine overall water quality status. The water quality status will help gauge the success of implementation aimed at reducing the amount of bacteria in the streams of the Clinch River and Tributaries watershed.

The DEQ monitoring stations in the Upper Clinch River watershed are described in Table 15 and shown in Figure 6. Stations are monitored every other month within the monitoring period listed in Table 17. The stations labeled 'trend' in sample frequency is the only station monitored continuously.

Currently, no volunteer monitoring is occurring in the Upper Clinch River watershed.

Table 17 DEQ's Existing and Proposed Monitoring Stations in the Upper Clinch River Watershed.

Station ID	Station Location	Monitoring Period
4ADOG000.80	Dog Creek at Route 600	2007-2008
4AHCK000.51	Hickory Creek at Route 641	2007-2008
4AFSF000.66	South Fork Falling River at Route 648 bridge	2009-2010
4ALRV005.17	Little Falling River at Route 618 bridge	2009-2010
4AMEY010.46	Mollys Creek at Route 654 bridge	2009-2010
4ASUC001.31	Suck Creek at Route 648	2009-2010
4AFRV025.34	Falling River at Route 650	2011-2012
4AFRV017.71	Falling River at Route 615	2011-2012
4AFRV003.07	Falling River at Route 40	2011-2012
4AFRV010.99	Falling River at Route 643	Trend – continual

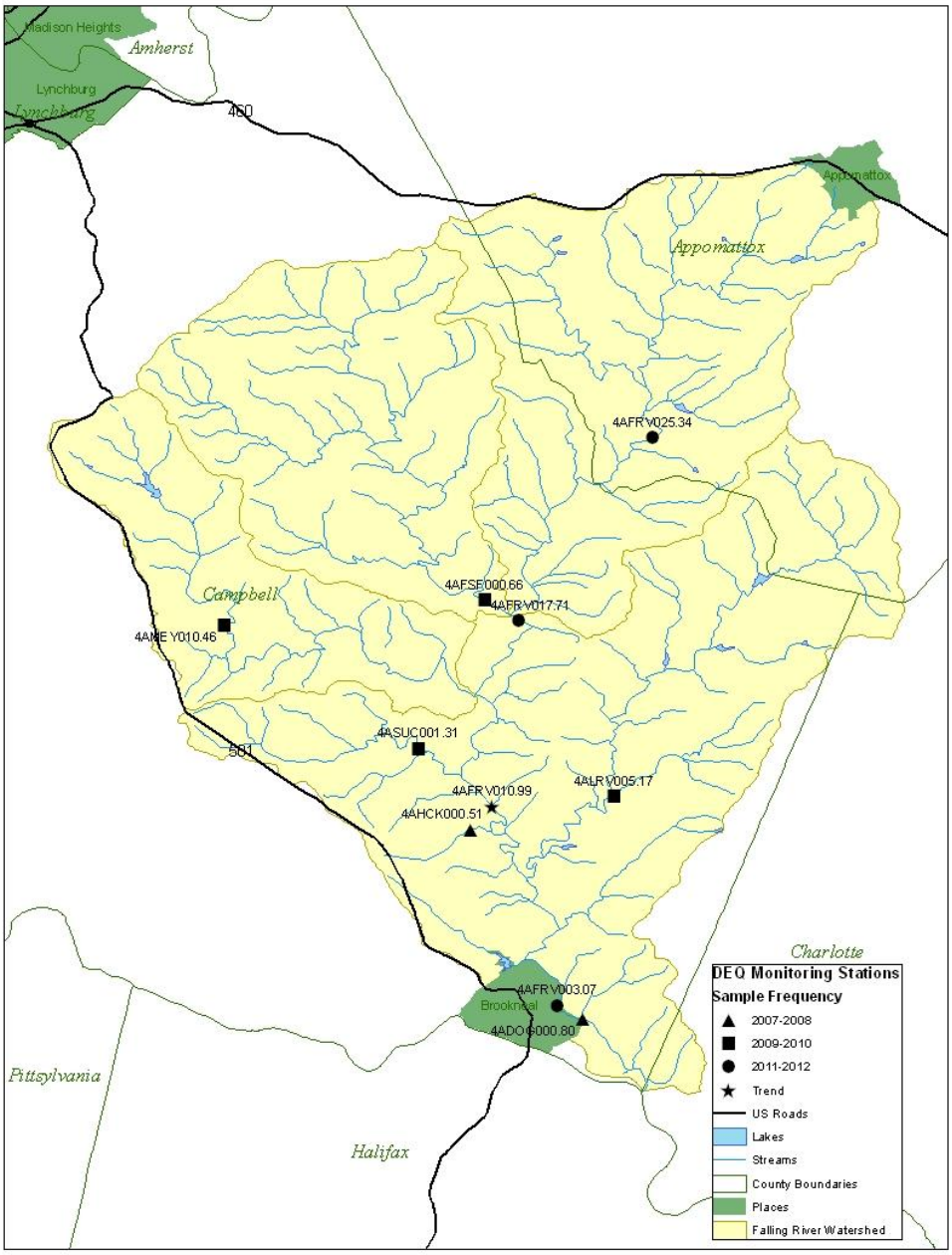

Figure 6 DEQ's Proposed Monitoring Stations in the Upper Clinch River Watershed.

Education

Personnel from the Tazewell SWCD will initiate contact with farmers in this watershed to encourage the installation of agricultural BMPs. This one-on-one contact will facilitate communication of the water quality problems and the corrective actions needed. The technical staff for the IP will conduct a number of outreach activities in the

watershed to raise local awareness, encourage community support and participation in reaching the implementation plan milestones. Such activities will include information exchange through newsletters, postcard mailings, field days and, presentations at local Ruritan and Rotary Clubs. The technical staff will work with organizations such as Virginia Cooperative Extension to sponsor farm tours and field days.

Stakeholders' Roles and Responsibilities

Stakeholders are individuals who live or have land management responsibilities in the watershed, including government agencies, businesses, private individuals and special interest groups. Stakeholder participation and support is essential for achieving the goals of this TMDL implementation plan effort.

ENVIRONMENTAL PROTECTION AGENCY

The EPA has the responsibility for overseeing the various programs necessary for the success of the Clean Water Act. However, administration and enforcement of such programs falls largely to the states. In the Commonwealth of Virginia, water quality problems are dealt with through legislation, incentive programs, education, and legal actions. Currently, there are six state agencies responsible for regulating activities that impact water quality with regard to this implementation plan. These agencies include: DEQ, DCR, VDH, VCE, DOF, and Virginia Department of Agriculture and Consumer Services (VDACS).

DEPARTMENT OF ENVIRONMENTAL QUALITY

DEQ has responsibility for monitoring the waters to determine compliance with state standards and for requiring permitted point dischargers to maintain loads within permit limits. They have the regulatory authority to levy fines and take legal action against those in violation of permits. Beginning in 1994, animal waste from confined animal facilities in excess of 300 animal units (cattle and hogs) has been managed through a Virginia general pollution abatement permit. These operations are required to implement a number of practices to prevent groundwater contamination. In response to increasing demand from the public to develop new regulations dealing with animal waste, in 1999 the Virginia General Assembly passed legislation requiring DEQ to develop regulations for the management of poultry waste in operations having more than 200 animal units of poultry (about 20,000 chickens) (ELI, 1999). On January 1, 2008 the Virginia Department of Environmental Quality (DEQ) assumed regulatory oversight of all land application of treated sewage sludge, commonly referred to as biosolids. DEQ's Office of Land Application Programs within the Water Quality Division to manages the biosolids program. The biosolids program includes having and following nutrient management plans for all fields receiving biosolids, unannounced inspections of the land application sites, certification of persons land applying biosolids, and payment of a $7.50 fee per dry ton of biosolids land applied.

DEPARTMENT OF CONSERVATION AND RECREATION

DCR is a major participant in the TMDL process. DCR has a lead role in the development of IPs to address non-point source pollutants such as bacteria from failing septic systems, pet waste, and livestock operations that contribute to water quality impairments. DCR provides available funding and technical support for the implementation of NPS components of IPs.

TAZEWELL SOIL AND WATER CONSERVATION DISTRICT

The Tazewell SWCD will provide outreach, technical and financial assistance to farmers and property owners in the Upper Clinch River watershed through the Virginia Agricultural BMP Cost-Share and Tax Credit programs. Their responsibilities will include promoting implementation goals, available funding and the benefits of BMPs and providing assistance in the survey, design, layout, and approval of agricultural BMPs. Education and outreach activities are a significant portion of their responsibilities. The Tazewell SWCD is currently receiving technical assistance funding to support their duties.

VIRGINIA DEPARTMENT OF AGRICULTURE AND CONSUMER SERVICES

Through Virginia's Agricultural Stewardship Act, the VDACS Commissioner of Agriculture has the authority to investigate claims that an agricultural producer is causing a water quality problem on a case-by-case basis (Pugh, 2001). If deemed a problem, the Commissioner can order the producer to submit an agricultural stewardship plan to the local soil and water conservation district. If a producer fails to implement the plan, corrective action can be taken which can include a civil penalty up to $5,000 per day. The Commissioner of Agriculture can issue an emergency corrective action if runoff is likely to endanger public health, animals, fish and aquatic life, public water supply, etc. An emergency order can shut down all or part of an agricultural activity and require specific stewardship measures. The enforcement of the Agricultural Stewardship Act is entirely complaint-driven. This Act is considered as a state regulatory tool that can support implementing conservation practices to address pollutant sources in TMDL impaired watersheds even though the Act does not specifically reference pathogens as a pollutant.

VIRGINIA DEPARTMENT OF HEALTH

VDH is responsible for maintaining safe drinking water measured by standards set by EPA. Their duties also include septic system regulation and, in the past, regulation of biosolids land application. Like VDACS, VDH's program is complaint-driven. Complaints can range from a vent pipe odor that is not an actual sewage violation and takes very little time to investigate, to a large discharge violation that may take many weeks or longer to effect compliance. In the scheme of this TMDL IP, VDH has the responsibility of enforcing actions to correct or eliminate failed septic systems and

straight pipes, respectively. VDH staff also issue permits for the repair and installation of septic systems and the installation of alternative waste treatment systems.

VIRGINIA DEPARTMENT OF MINES MINERALS AND ENERGY

DMME regulates all land-disturbing, mining, reclamation from coal-mining and gas well drilling operations. Their duties include isssuing and enforcing permits and assessing reclamation efforts. The pictures below show before and after a gob pile reclamation.

LOCAL GOVERNMENTS

Local governments can develop ordinances involving pollution prevention measures and play a very active role in the TMDL implementation process.

The local governments can play a very active role in the implementation process. For example, they could promote a septic system maintenance program. This could be done by handing out literature when individuals apply for a building permit. It is recommended (if it has not done so already) that Tazewell County adopt a reserve area for land parcels using on-site wastewater treatment of equal size to the approved on-site disposal system for use in the event the on-site disposal system fails. Further, the reserve area shown must be of equal capacity to the primary drainfield using the same technology as the primary system. Nothing shall be constructed within the reserve area. The county government could also play an active role in the proper disposal of pet waste. Future subdivisions should be developed with sustainable growth practices that minimize of eliminate storm water runoff.

Successful implementation depends on stakeholders taking responsibility for their role in the process. This could include using pet waste composters if they have dogs, getting septic tanks pumped on a regular basis and talking with friends and neighbors about things they can do to protect water quality. While the primary role falls on the landowner, local, state and federal agencies also have a stake in seeing that Virginia's waters are clean and provide a healthy environment for its citizens. While it is unreasonable to expect that the natural environment (e.g., streams and rivers) can be made 100% free of risk to human health, it is possible and desirable to minimize anthropogenic problems. Virginia's approach to correcting NPS pollution problems has been, and continues to be, encouragement of participation through education and financial incentives. However, if progress is not made toward restoring water quality using this voluntary approach, regulatory controls may be established and enforced.

WATER QUALITY PROGRAMS AND ACTIVITIES

Each watershed in the state is under the jurisdiction of a multitude of individual yet related water quality programs and activities, many of which have specific geographic boundaries and goals. These include but are not limited to TMDLs, roundtables, water quality management plans, erosion and sediment control regulations, stormwater management, a source water protection program, and local comprehensive plans. Coordination of the implementation project with these existing programs could result in additional resources and increased participation.

FUNDING FOR IMPLEMENTATION

Potential funding sources available to assist with implementation were identified during implementation plan development. Detailed descriptions can be obtained from the Pittsylvania SWCD, DCR, NRCS, and VCE. Sources include:

Federal

Community Development Block Grant Program

Conservation Reserve Program (CRP)

Conservation Reserve Enhancement Program (CREP)

Environmental Quality Incentives Program (EQIP)

Wildlife Habitat Incentive Program (WHIP)

Wetland Reserve Program (WRP)

State

Clean Water State Revolving Fund

Virginia Agricultural Best Management Practices Cost-Share Program

Virginia Agricultural Best Management Practices Tax Credit Program

Virginia Agricultural Best Management Practices Loan Program

Virginia Small Business Environmental Assistance Fund Loan Program

Virginia Water Quality Improvement Fund

Local

Indoor Plumbing Rehabilitation program

Private

Small Watershed Grants Program

Southeast Rural Community Assistance Project (SE/R-CAP)

National Fish and Wildlife Foundation

List of Acronyms

BMP	Best Management Practice
BST	Bacteria Source Tracking
CREP	Conservation Reserve and Enhancement Program
CWA	Clean Water Act
DCR	Virginia Department of Conservation and Recreation
DEQ	Virginia Department of Environmental Quality
DOF	Virginia Department of Forestry
EPA	Environmental Protection Agency
EQIP	Environmental Quality Incentive Program
FTE	Full Time Equivalent
GWG	Government Working Group
IP	Implementation Plan
NPS	Nonpoint Source Pollution
NRCS	Natural Resources Conservation Service
RWG	Residential Working Group
LE-1T	Grazing Land Protection System
SWCD	Soil and Water Conservation District
TMDL	Total Maximum Daily Load
VCE	Virginia Cooperative Extension
VDACS	Virginia Department of Agriculture and Consumer Services
VDH	Virginia Department of Health
WP-2T	Streambank Protection

LIST OF CONTACTS

Virginia Dept. of Environmental Quality 355 Deadmore Street Abingdon, VA 24212	(276) 676-4800
Virginia Dept. of Conservation and Recreation Abingdon Regional Office Abingdon, VA. 24210	(276) 676-5418
Virginia Dept. of Health Cumberland Plateau Health District P.O. Box 2347 Lebanon, VA 24266	(276) 889-7695
Virginia Cooperative Extension Service 552 East Riverside Drive North Tazewell, VA 24630	(276) 988-0367
Natural Resources Conservation Service Christiansburg Service Center 75 Hampton Boulevard Christiansburg, VA 24073	(540) 381-4221
Tazewell Soil and Water Conservation Service 117 Dial Rock Road Tazewell, VA 24202	(276) 988-9588
Virginia Dept. of Agriculture and Consumer Services P.O. Box 1163 Richmond, VA 23218	(804) 786-3501
MapTech, Inc. 3154 State Street Blacksburg, VA 24060	(540) 961-7864